This list of claims replaces all prior versions of claims in the application.

Listing of Claims

1. (original) A system for forming a layer on a coating surface of a substrate, comprising:

a reaction chamber configured to enclose the coating surface of the substrate, the reaction chamber including at least one inlet configured to supply at least two precursors to the coating surface, the precursors being reactive with each other in the reaction chamber to produce a layer material;

a precursor exposure controller configured to alternatingly deliver pulses of the at least two precursors to the coating surface, wherein the layer is formed by reaction of the precursors with accumulation of the layer material on the coating surface;

a monitor configured to measure a characteristic of the coating surface of the specimen during or after layer formation and to provide a monitor output corresponding to the measured characteristic; and

a controller connected to the monitor, the controller including a pulse selector configured to select a number of pulses delivered to the coating surface based on the monitor output.

2. (original) The system of claim 1, wherein the reaction chamber includes a chamber wall having a perimeter aperture and configured to retain the substrate so that the coating surface faces an interior of the reaction chamber and a second surface of the substrate faces away from the interior of the chamber.

3. (original) The system of claim 2, further comprising a seal situated at the perimeter aperture between the substrate the chamber wall, the seal being configured to impede flow of precursors out of the reaction chamber.

4. (original) The system of claim 1, wherein the reaction chamber includes a monitor window situated to avoid exposure of the monitor window to at least one precursor.

5. (original) The system of claim 4, further comprising a flow shield configured such that a monitor window situated relative to the flow shield is located substantially outside the flow of a precursor.

6. (original) The system of claim 1, wherein the monitor is configured to measure an optical property of the coating surface.

7. (original) The system of claim 6, wherein the optical property is reflectance or transmittance.

8. (original) An apparatus for forming a multilayer optical filter, the apparatus comprising:

a reaction chamber configured to retain a substrate, the reaction chamber defining a monitor aperture;

at least one precursor inlet for admitting at least one precursor to the reaction chamber;

at least one exit port for removing the precursor from the reaction chamber;

an optical measurement system comprising a source configured to produce a measurement light flux and to direct the light flux to the monitor-aperture, and a receiver configured to receive a portion of the measurement light flux from the monitor aperture; and

a controller in communication with the receiver and configured to select a number of alternating exposures of the substrate to at least one reactant based on a measurement of the measurement light flux returned to the receiver.

9. (original) The apparatus of claim 8, wherein the source is a laser.

10. (original) The apparatus of claim 8, wherein the receiver includes an optical spectrum analyzer.

11. (original) The apparatus of claim 8, further comprising a planetary system configured to rotate the substrate in the reaction chamber.

12. (original) The apparatus of claim 11, wherein the controller is configured to determine a rotation rate of the substrate.

13. (original) A reaction chamber for atomic layer epitaxy, comprising:

an exterior wall,:

an aperture defined in the exterior wall;

a substrate holder situated at the aperture; and

a seal situated to impede a flow of precursors between the substrate and the exterior wall.

14. (original) A method of forming a layer on a substrate, comprising:

delivering a measurement light flux to a surface of a substrate;

alternately exposing the surface of the substrate to a first precursor and a second precursor, the first and second precursors being reactive with each other to form a first material;

allowing the first and second precursors to form a sublayer of the first material on the surface; and

determining a characteristic of the sublayer or of a combination of the sublayer with earlier formed sublayers on the surface, based on a measurement of a portion of the measurement light flux received from the surface.

15. (original) The method of claim 14, further comprising the step of exposing the surface of the substrate to a number of alternating exposures, the number being based on a measurement of the portion of the measurement light flux.

16. (original) The method of claim 15, wherein the step of determining a characteristic of the sublayer or of a combination of the sublayer with earlier formed sublayers on the surface is based on a measurement of a portion of the measurement light flux received from a portion of the surface distinct from the portion at which the characteristic is determined.

17. (original) The method of claim 15, wherein the measurement is a measurement of transmittance or reflectance.

18. (original) The method of claim 15, wherein the measurement is a measurement of transmittance or reflectance as a function of wavelength.

19. (original) The method of claim 15, wherein the measurement is an ellipsometric measurement.

20. (original) A computer-readable medium containing computer-executable instructions for selecting a number of sublayers formed in atomic layer deposition based on a measurement of a substrate.

21. (canceled)

22. (canceled).

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26. (canceled)

27. (canceled)

28. (canceled).

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31. (canceled)

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35. (canceled)